ENVIRODYNE
ENGINEERS

12161 Lackland Road,
St. Louis, Missouri 63141
(314) 434-6960

March 24, 1983

Mason and Hanger -
Silas Mason Co., Inc.
Cornhusker Army Ammunition Plant
Post Office Box 2061
Grand Island, Nebraska 68802

RE: Contract No. 6907

Gentlemen:

Envirodyne Engineers, Inc. is pleased to present this draft report for the additional sampling and analysis conducted at Cornhusker Army Ammunition Plant (CAAP) as authorized by Amendments No. 2 and 3 to our original contract.

In this report, a written documentation of the procedures and results of the additional work is presented. If you have any questions regarding this information, please feel free to contact me.

Sincerely,

Carol H. Byington

Carol H. Byington, Ph.D.
Senior Associate

CHB/nja
Enclosure

DRAFT REPORT

Amendments No. 2 and 3 (Contract 6907) to Cornhusker Army Ammunition Plant Contamination Survey

Mason & Hanger-Silas Mason Co., Inc.
Cornhusker Army Ammunition Plant
Grand Island, Nebraska
Contract No. DAAA09-80-C-3005

Envirodyne Engineers, Inc.
12161 Lackland Road
St. Louis, Missouri 63141

1748
March 1983

ENRV/PLNG
CC: ARWM
WATR
ENSV

DEPARTMENT OF THE ARMY
CORNHUSKER ARMY AMMUNITION PLANT
GRAND ISLAND, NEBRASKA 68801

April 18, 1983

SARCO

RECEIVED
APR 22 1983
EIS/[illegible] BRANCH

Director
Department of Environmental Control
State of Nebraska
P. O. Box 94877
State House & Station
Lincoln, Nebraska 68509

Dear Sir:

I am taking this opportunity to provide you with the results (Enclosure 1) of the cooperative groundwater sampling and analysis effort conducted in Hall County by the U. S. Army Toxic and Hazardous Materials Agency (USATHAMA) and the Hall County Department of Health (HCDH). A summary of the findings has also been prepared (Enclosure 2).

This effort was conducted as part of the USATHAMA Installation Restoration (IR) Program at Cornhusker Army Ammunition Plant (CAAP). On November 4, 1982, a briefing was conducted at CAAP regarding the environmental survey of the installation, with representatives from the City of Grand Island, HCDH, the State of Nebraska Department of Environmental Control, (NDEC), and the U. S. Environmental Protection Agency, Region VII, in attendance. Findings of the survey indicated localized explosive groundwater contamination at CAAP extending to the eastern boundary. In order to determine the total extent of contamination NDEC requested an off-post investigation by USATHAMA. In addition, NDEC requested information on human health implications of explosives in groundwater. Human health criteria has not been officially established by Federal authorities. However, the Army has determined recommended water quality criteria for explosives in water. These are provided for your review (Enclosure 3).

Results of the off-post effort appear to warrant an additional sampling and analysis effort in order to totally define the extent of off-post contamination. The Army is prepared to initiate a cooperative effort with HCDH to achieve this objective. USATHAMA is also obtaining additional informa-

tion to fully define the extent and magnitude of groundwater contamination on post at CAAP. Based upon a total problem definition, plans for remedial measures, if they are necessary, will be developed.

USATHAMA is prepared to brief your office on the sampling and analysis findings and coordinate plans for further work that will assist in obtaining a full understanding of the problem. Please contact me if you would like to arrange for a meeting to ask questions or discuss these matters. The point of contact for CAAP is Mr. S. C. Fisher, (308) 389-2100.

Sincerely,

S. C. Fisher
Commander's Representative

Enclosures

CF:
US Environmental Protection Agency, Region VII, ATTN: Regional Administrator, 324 E. 11th Street, Kansas City, MI 64106 w/encl
Commander, US Army Armament Materiels Development Command, ATTN: DRSAR-ISE/Mr. T. Wash, Rock Island, IL 61299 wo/encl
Commander, US Army Toxic and Hazardous Materials Agency, ATTN: DRXTH-AS, Aberdeen Proving Ground, Maryland 21010 wo/encl

TABLE 2-2

SUMMARY OF POSITIVE RESULTS*

Well	2,4-DNT	1,3,5-TNB	2,4,6-TNT	RDX
Monitoring Wells:				
G16	1.74		1.53	
G17		25.3	14.4	32.3
G21				66.4
G22		6.10	30.9	16.7
G23	0.96	159	902	135
G24			16.0	180
Irrigation Wells:				
I12		13.4	10.1	
Off-Post Wells:				
001				59.7
003				17.6
005	1.13			
007				18.2
008				265

NOTES: *Values listed are all those found above the Hubaus and Vos detection limits and are μg/l.

DASG-PSP-E (4 Jun 82) 1st Ind
SUBJECT: Environmental Criteria for Explosives in Drinking Water

DA, OTSG, WASH DC 20310, 17 November 1982

TO: Commander, US Army Materiel Development and Readiness Command, ATTN: DRCSG-S, 5001 Eisenhower Avenue, Alexandria, VA 22333

1. References:

a. 1st Ind, HSHB-EW, dated 7 September 1982, subject as above. (Incl 2)

b. Letter, SGRD-UBG-O, dated 19 August 1982, subject as above. (Incl 3)

2. Your request for guidance on acceptable or allowable levels of TNT, RDX and Tetryl is drinking water dated 4 June 1982, has been reviewed by USAEHA and BRDL.

3. As interim drinking water limits for TNT and RDX, the Army suggests 0.035 mg/L & 0.044mg/L, respectively. Data for tetryl are insufficient to support a limit statement; however, there is a belief that tetryl is sufficiently unstable in the role of a ground water contaminant that it would not be present. Picric acid and methyl nitramide are likely decomposition products of tetryl, and picric acid has mutagenic potential.

4. It should be noted that the suggested limits in paragraph 3 have not been approved by the appropriate State or Federal Authorities.

FOR THE SURGEON GENERAL:

2 Incl
wd incl 1
added 2 incl
2 & 3. as

GEORGE E.T. STEBBINS, M.D.
Colonel, MC
Chief, Preventive Medicine Consultants Division

DEPARTMENT OF THE ARMY
CORNHUSKER ARMY AMMUNITION PLANT
GRAND ISLAND, NEBRASKA 68801

RELEASE 3-83

18 April 1983

NEWS RELEASE

The findings of a limited off-post survey at Cornhusker Army Ammunition Plant (CAAP) indicate that low levels of explosive wastes have migrated beyond the plant's eastern boundary.

The off-post effort was conducted when an earlier survey of CAAP confirmed that explosive wastes from past operations have contaminated the shallow groundwater at the plant.

Samples from 15 private wells east of the installation were collected in January by the Hall County Health Department and provided to the Army for analysis for explosive waste residues.

Low levels of RDX, an explosive compound, were detected in three water supply wells and one irrigation well within one mile of the plant boundaries. At present, no criteria have been established for explosive compounds in water by the U. S. Environmental Protection Agency (EPA) or the State of Nebraska.

The State of Nebraska Department of Environmental Control and Region VII of the EPA have been notified of the survey results.

The Army is planning to hold a meeting with the State of Nebraska and EPA to discuss any health implications due to the contamination found off post of CAAP.

The Army in coordination with the State and Hall County is planning to initiate a more extensive off-post survey to further define the extent and degree of the off-post contamination.

An expanded on-post survey is currently being conducted to determine the magnitude of the contamination at CAAP.

The on-post survey, currently being performed under contract by Battelle Pacific Northwest Laboratories, is managed by the Army's Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD. All actions at CAAP are coordinated with the Hall County Health Department, the State of Nebraska, and EPA Region VII.

# # #

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Grand Island Daily Independent
Hall County Health Department
M&H-SM Co., Inc.

CHAPTER 1

INTRODUCTION

In January of 1983, Envirodyne Engineers, Inc. received amendments to their original contract to conduct a preliminary contamination survey of the Cornhusker Army Ammunition Plant (CAAP) in Grand Island, Nebraska. These amendments asked Envirodyne to conduct sampling at approximately 45 locations including on-post irrigation/water supply wells, on-post monitoring wells, on-post irrigation wells and various specified off-post wells. These well samples were then to be analyzed by Envirodyne for nitroaromatics and the data entered into the data base for the contamination survey.

The objective of this report is to provide written documentation of the procedures and results of this additional sampling.

CHAPTER 2

FIELD SAMPLING AND ANALYSIS

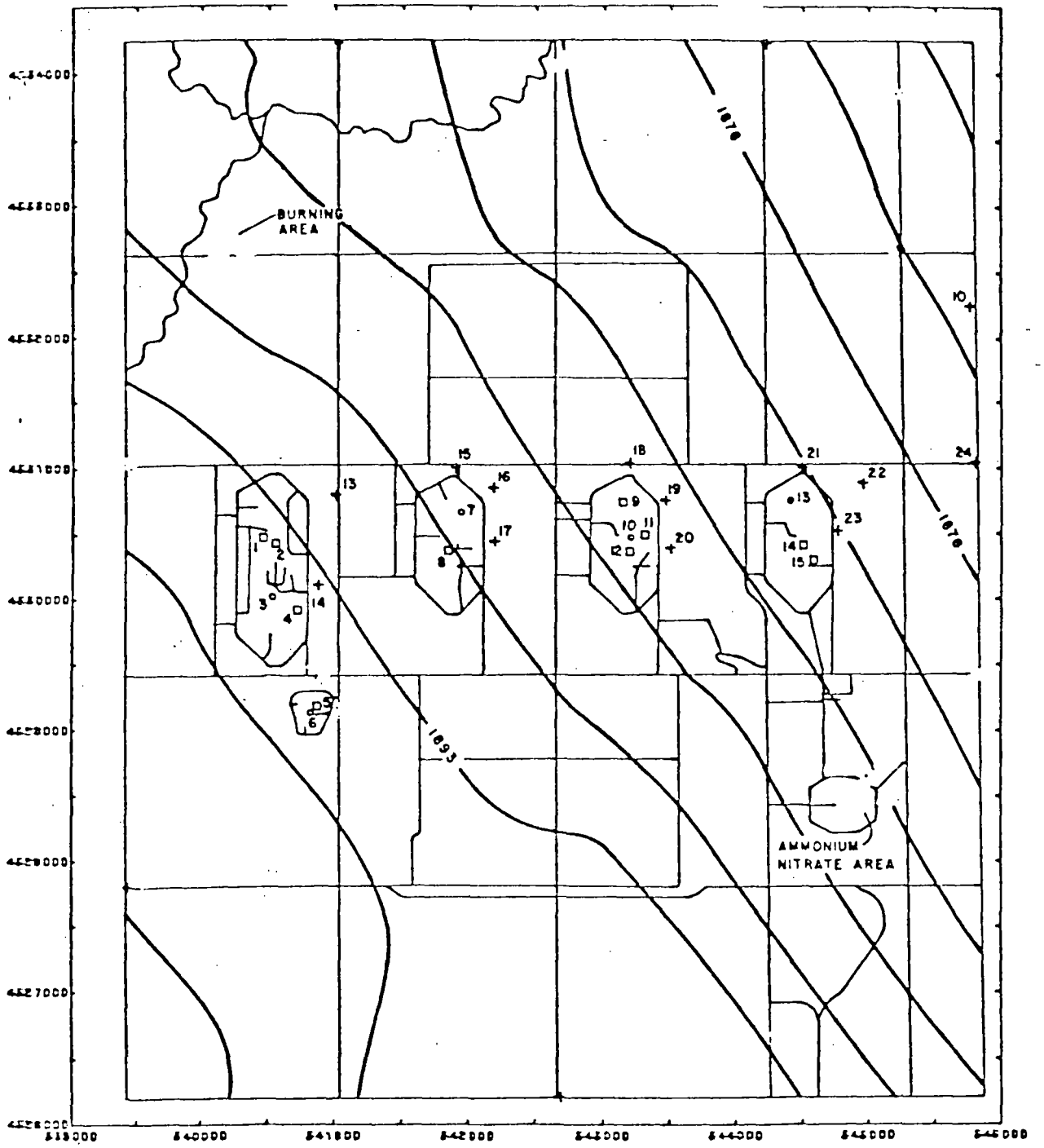
SAMPLING LOCATIONS AND DESCRIPTIONS

This round of groundwater sample collection for analysis was completed by EEI from January 14-19, 1983. Wells sampled included EEI-installed, on-post monitoring wells, and existing irrigation wells and supply wells, both within and outside the installation boundaries. These wells included 30 on-post sites consisting of 13 EEI-installed monitoring wells, 13 irrigation wells, and 4 water supply wells. The off-post sites included 16 wells: 11 pressure-hydrant, domestic use systems and 5 irrigation wells. A total of 46 wells were sampled in this effort. The locations of these wells are shown on the following figures: Figure 2-1 shows the EEI-installed monitoring wells, Figure 2-2 shows the on-post irrigation/supply wells, and Figure 2-3 shows the off-post irrigation/domestic supply wells.

The EEI-installed monitoring wells sampled were shallow wells (average depth of 34 feet) of solvent welded 4-inch PVC pipe construction. The CAAP Geotechnical Report, submitted earlier, contains additional information regarding the specific construction details. Construction details of the remaining USATHAMA-designated well-sites are not fully available. Estimates of well-depth and casing-diameter were obtained from landowners, and attempts to make such measurements in the field were made wherever possible. The results of these findings are summarized in Table 2-1.

SAMPLING EQUIPMENT AND PROCEDURES

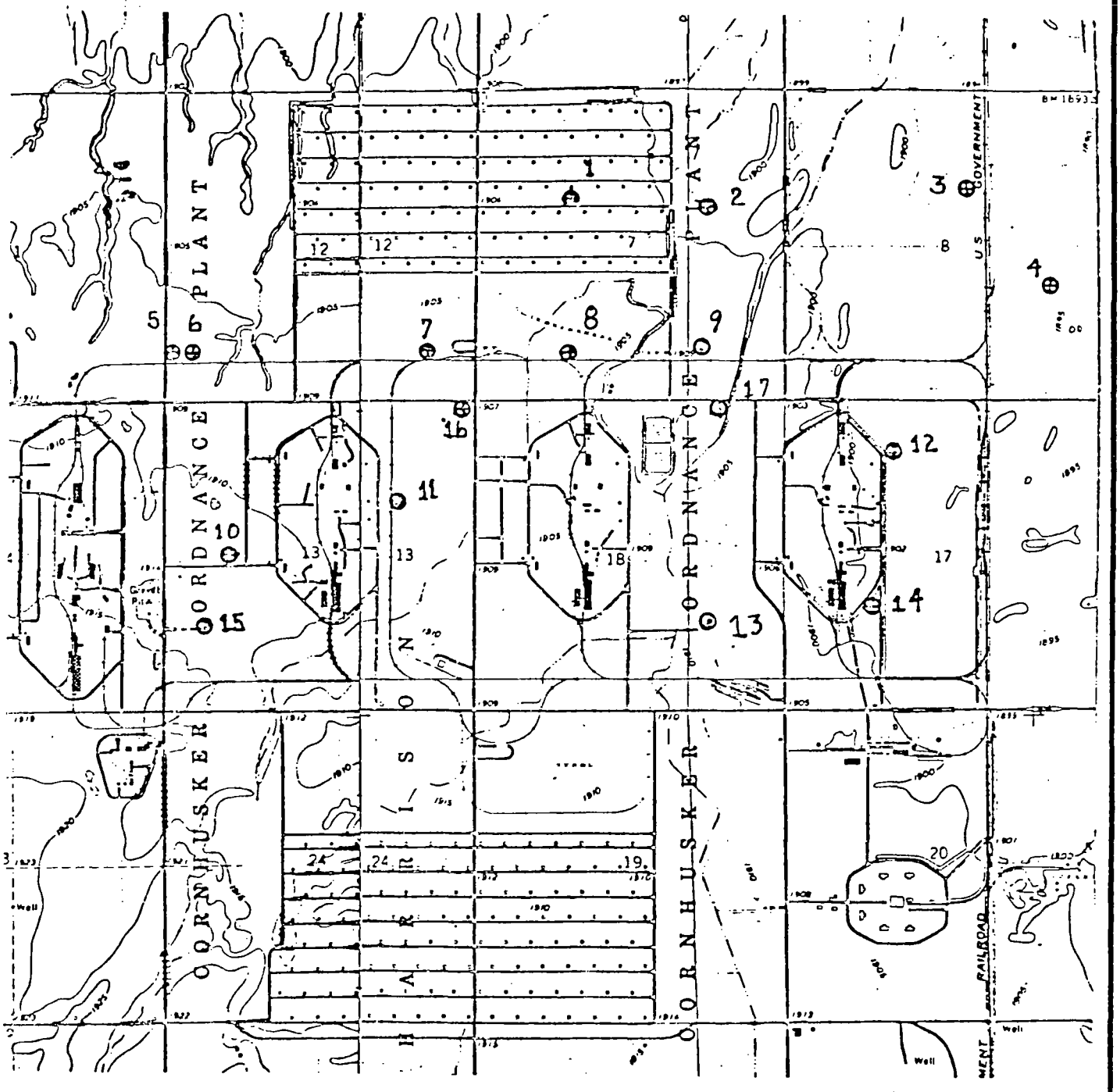
The 13 EEI-installed monitoring wells were sampled using deep well submersible pumps. Both a 4-inch diameter, 30 gallons per minute (gpm) model, and a 3-inch diameter, 7 gpm model were used. The original plan involved using the 4-inch pump exclusively for these monitoring wells, but the impeller system bound up with sand and the pump could only be used for 4 of the 13 monitoring wells. The 3-inch pump was used as a back-up unit for the remainder of the wells. As prescribed in the original contract specifications, these wells were purged of 5 times the standing volume of water in the borehole prior to taking the sample. The samples were collected directly from



ENVIRODYNE ENGINEERS

EEI-Installed Monitoring Wells

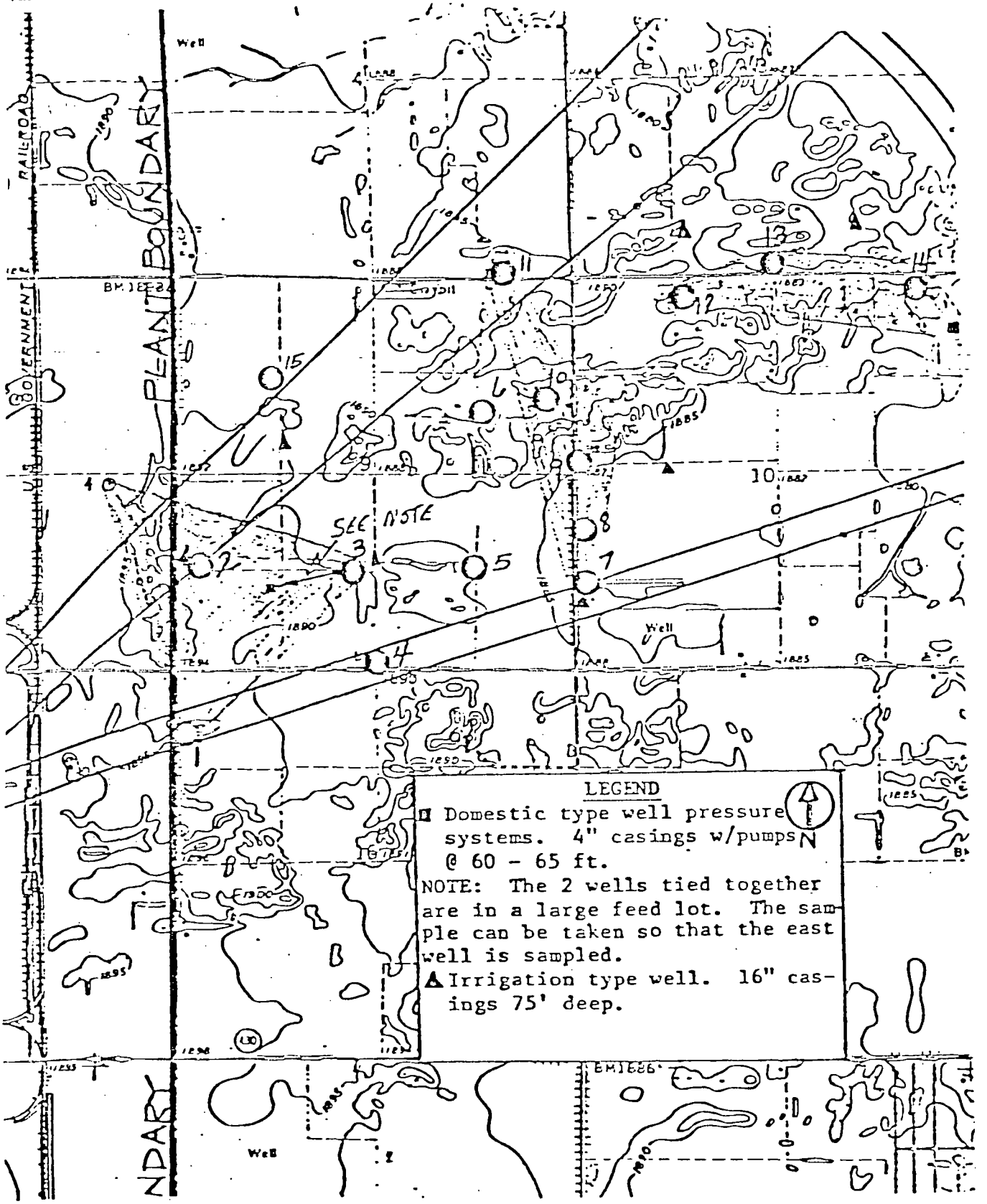
Figure 2-1



ENVIRODYNE ENGINEERS

On-Post Irrigation/Supply Wells

Figure 2-2



ENVIRODYNE ENGINEERS

Off-Post Irrigation/Domestic Supply Wells

Figure 2-3

TABLE 2-1

GROUNDWATER SAMPLING SUMMARY

Well No.	W.T. Depth Ground SFC	Well Depth	Calculated Volume	Purged Volume	Date Sampled	Pump Used	Type of Well
G10	14.21	30.5	34.2	176	1-19-83	S-3	Monitor
13	18.48	36.0	36.8	184	1-18-83	S-3	Monitor
14	20.37	35.25	31.2	*200	1-15-83	S-3	Monitor
15	19.71	35.0	32.1	162	1-18-83	S-3	Monitor
16	20.89	32.0	23.3	250	1-19-83	S-3	Monitor
17	19.73	33.92	29.8	210	1-15-83	S-4	Monitor
18	19.54	35.12	32.7	240	1-14-83	S-4	Monitor
19	20.06	35.08	31.5	300	1-15-83	S-4	Monitor
20	21.46	34.69	27.8	240	1-15-83	S-4	Monitor
21	17.45	36.34	39.7	198	1-18-83	S-3	Monitor
22	17.34	35.0	37.1	192	1-19-83	S-3	Monitor
23	18.48	35.83	36.4	200	1-19-83	S-3	Monitor
24	16.83	33.0	33.9	180	1-15-83	S-3	Monitor
1	16.75	58.0	431	800	1-14-83	C	Irrigation
2	ND	ND	ND	2500	1-14-83	I	Irrigation
3	16.7	58.0	341	2000	1-14-83	I	Irrigation
4	14.0	61.0	492	1600	1-14-83	I	Irrigation
5	ND	ND	ND	1500	1-17-83	I	Irrigation
6	16.2	56.0	416	**125	1-17-83	C	Irrigation
7	17.8	68.0	524	1250	1-14-83	I	Irrigation
8	17.9	ND	ND	1400	1-14-83	I	Irrigation
9	19.5	ND	ND	2000	1-14-83	I	Irrigation
10	19.9	77.75	604	2500	1-17-83	I	Irrigation
11	ND	ND	ND	4000	1-14-83	I	Irrigation
12	15.9	ND	ND	4000	1-14-83	I	Irrigation
13	ND	ND	ND	11000	1-14-83	P	Water Supply
14	ND	ND	ND	10000	1-14-83	I	Irrigation
15	ND	ND	ND	672	1-14-83	E	Water Supply
16	ND	ND	ND	840	1-14-83	E	Water Supply
17	ND	ND	ND	857	1-14-83	E	Water Supply
1	ND	60	ND	ND	1-17-83	H	Domestic
2	ND	60	ND	ND	1-17-83	H	Domestic
3	ND	60	ND	ND	1-17-83	H	Domestic
4	13.67	*78	672	**60	1-17-83	C	Irrigation
5	ND	*78	ND	*500	1-17-83	C	Irrigation
6	14.58	68.0	558	**50	1-17-83	C	Irrigation
7	ND	*60	ND	ND	1-17-83	H	Domestic
8	12.50	*60	496	**50	1-17-83	C	Irrigation
9	ND	60	ND	ND	1-17-83	H	Domestic
10	ND	*65	ND	ND	1-17-83	H	Domestic
11	ND	60	ND	ND	1-17-83	H	Domestic
12	ND	40	ND	ND	1-17-83	H	Agriculture
13	ND	65	ND	ND	1-17-83	H	Domestic
14	ND	*60	ND	ND	1-17-83	H	Domestic
15	13.6	50.0	386	110	1-17-83	C	Irrigation
16	ND	ND	ND	ND	1-18-83	H	Domestic

Notes: ND=No data available
I=Irrigation Pump
C=Centrifugal Pump
S=Portable Submersible Pump
S-3=3"; S-4=4"
P=Deep Primary Supply Well Pump
E=Electric Centrifugal Pump
H=Pressure Hydrant
*estimated
**Okayed by Peter Wirth - USATHAMA

the discharge hose of the pump into a glass gallon jar. The sample container was rinsed several times with sample water prior to collection.

The remaining 33 wells were sampled by various means depending upon the conditions of the site. These methods incuded using the in-place irrigation pump coupled to the power takeoff unit of a tractor, a small gasoline-powered centrifugal pump, a small electric-powered centrifugal pump, the water supply system pumps, and the hydrant pressure systems of the off-post domestic supplies. Table 2-1 lists the wells sampled with their respective measurements, pumping methods, and descriptions.

An attempt was made to obtain the water table depth and well depth at each irrigation well. Generally, a small port was accessible and a weighted tape measure was lowered into the well casing to determine the depths. The domestic supply wells and plant supply wells were inaccesible to these measurements.

On-post irrigation wells, where possible, were purged and sampled utilizing the existing in-place pumps. A tractor was used to turn the pump shaft via a belt attached to the well spindle and the tractor's power take-off. The water was discharged through the irrigation systems' turnouts, from which the sample was collected. Each of these wells was purged for a 5-minute period with flow rates ranging from 200 to 800 gpm. Flows were estimated by CAAP personnel.

The active water supply wells on-post were sampled using a small electric-powered centrifugal pump, capable of a flow rate of about 3.5 gpm. These were set up early in the day and run for approximately 4 hours to purge. Samples were taken from a discharge hose. At Pump House No. 4, the well was purged using the in-place water supply pump and a sample was drawn-off of the discharge line using a garden hose.

Those irrigation wells which could not be turned with tractor set-up were purged and sampled using a gasoline-powered, 50 gpm centrifugal pump. The sample was collected from a discharge hose.

Domestic supply wells off-post were of the pressure system type. These systems were turned on and allowed to run for 10 minutes prior to sample collection to purge the supply lines. Mr. Gene Rallens of the Hall County Health Department was present to actually collect the sample. This procedure was required by the State of Nebraska and USATHAMA officials. Mr. Rallens also collected a sample from domestic sources for analysis by the County Health Department.

SAMPLE HANDLING

Upon collection, each sample was placed in a cooler and put on ice for preservation. All filtering was performed in the EEI laboratory upon receipt of the samples. Samples were shipped to the EEI laboratory daily via air freight.

ANALYTICAL METHODS

The samples of groundwater were filtered through a 0.45 micron filter, then were extracted and analyzed using the methods tested during the certification for the survey conducted in 1981-1982. These methods were presented in the Quality Control Plan previously submitted. A summary of the methods is presented below:

Analyte	USATHAMA Method Code
RDX	3S
Nitrobenzene (NBX) 2,4-dinitrotoluene (2,4-DNT) 2,6-dinitrotoluene (2,6-DNT) 1,3-dinitrobenzene (1,3-DNB) 1,3,5-trinitrobenzene (1,3,5-TNB) 2,4,6-trinitrotoluene (2,4,6-TNT)	6N

QUALITY CONTROL

The quality control procedures for these analyses are those described in the CAAP Quality Control Plan and summarized below:

- One method blank analyzed with each lot of samples
- Initial instrument calibration with three standards including two calibration standards during each day of analysis
- One control spike (5DL) analyzed with each lot. This was prepared by adding the analytes of interest to background well water:

Analyte	Control Spike (µg/l)
RDX	50
NBX 2,6-DNT 1,3-DNB 1,3,5-TNB 2,4,6-TNT	5
2,4-DNT	2.5

The control spike for each lot was compared to previous control data generated during the 1981-1982 survey. These control data consisted of certification results for the spike level being used and the control spike results generated with analysis of the sample lots collected during the 1981-1982 survey. When the new control spike was not in control (not within ±3 σ of the spike level), the data were reviewed to determine whether the sample was spiked incorrectly. When it was determined that there was a problem involving the analysis, the entire lot was re-extracted and re-analyzed for the analytes which were not in control. In four of the five sample lots analyzed, one or more of the analytes in the control spike was below the control range. Therefore, the samples and control spikes were re-extracted and re-analyzed for the compounds listed below.

Lot	Compounds	Rerun Result
BAA	2,6-DNT	acceptable
	2,4-DNT	low, use first run
	NB	acceptable
	1,3-DNB	ND
BAB	1,3-DNB	low
	2,4-DNT	low, use first run
BAC	2,6-DNT	acceptable
	2,4-DNT	acceptable
	1,3,5-TNB	acceptable
	1,3-DNB	low
	NB	acceptable
BAE	1,3-DNB	low
	2,4-DNT	acceptable
	1,3,5-TNB	acceptable
	2,4,6-TNT	acceptable

The accuracy values were updated for each lot by adding the new control spike to the previously accumulated data. The precision values were updated in the same manner.

ANALYTICAL RESULTS

Data Reporting

The analytical data for the well water samples are summarized in Appendix A by site identification, in Appendix B by test identification, and in Appendix C by lot number. These are corrected concentration values calculated by dividing the found concentration by the accuracy (slope of the Hubaux and Vos linear regression line). All results were corrected; if the corrected result was below the Hubaux and Vos detection level, it was reported as less than the detection limit. Otherwise, the corrected value was reported. A summary of positive results is included as Table 2-2.

Detection Limits/Positive Results

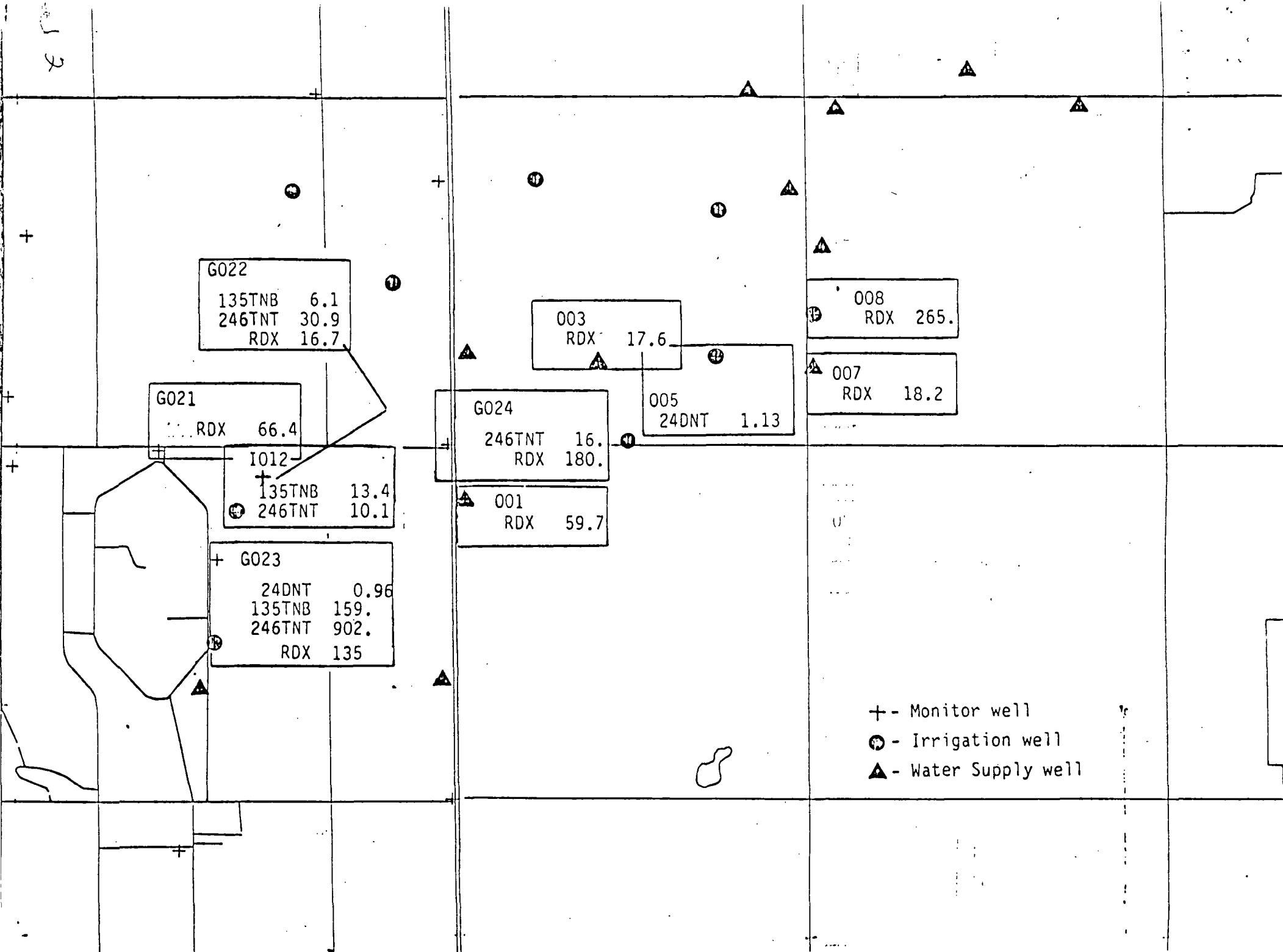
Detection limits for quantitative analyses were previously determinted in natural water and calculated by the Hubaux and Vos method. These limits are shown in Table 2-3.

Appendices A, B and C contain the data for all samples, method blanks and control spikes. Most of the samples did not contain detectable levels of the analytes of concern. The samples which did show a positive concentration (above the Hubaux and Vos detection limit) of one or more analytes are listed in Table 2-2.

TABLE 2-3

HUBAUX AND VOS DETECTION LIMITS

	Water (µg/l)
Nitrobenzene	2.1
2,4-DNT	0.90
2,6-DNT	0.68
1,3-DNB	2.2
1,3,5-DNB	1.9
2,4,6-TNT	1.2
RDX	9.6


G022
135TNB 6.1
246TNT 30.9
RDX 16.7
G021
RDX 66.4
I012
135TNB 13.4
246TNT 10.1
G023
24DNT 0.96
135TNB 159.
246TNT 902.
RDX 135
003
RDX 17.6
005
24DNT 1.13
G024
246TNT 16.
RDX 180.
001
RDX 59.7
008
RDX 265.
007
RDX 18.2
+ - Monitor well
- Irrigation well
- Water Supply well

DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
WASHINGTON, DC 20310

REPLY TO ATTENTION OF

DASG-PSP-E

17 February 1983

SUBJECT: Environmental Criteria for Explosives in Drinking Water

Commander
US Army Materiel Development
and Readiness Command
ATTN: DRCSG-S
5001 Eisenhower Avenue
Alexandria, VA 22333

1. Reference is made to 1st Ind, DASG-PSP-E, subject as above, dated 17 Nov 82.

2. The interim drinking water limits in paragraph 3 of reference 1 were inadvertently reversed. They should be: RDX - 0.035 mg/L; TNT - 0.044 mg/L.

FOR THE SURGEON GENERAL:

GEORGE E. T. STEBBING, M.D.
Colonel, MC
Chief, Preventive Medicine
Consultants Division